FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Apl. 12	**Lecture, "Some Controversial Points in Aircraft Design," by F. T. Hill, before I.Ae.E.**
May 11	**Lecture, "Experimental Flying," by Maj. M. E. A. Wright, before I.Ae.E.**
June 23	**Grosvenor Challenge Cup, Lympne**
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July	**Air Race for King's Cup**
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Aug. 1	**Entries close from British Competitors for Schneider Cup**
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1924	
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The Index for Vol. XIV of FLIGHT (January to December, 1922) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1s. per copy (1s. 1d. post free).

EDITORIAL COMMENT.

ALTHOUGH his decision to offer a £500 prize for "light 'planes" must have been made some little time previously, the actual announcement that His Grace the Duke of Sutherland, Under-Secretary of State for Air, is giving such a prize comes at a particularly appropriate moment. The recent flights made by Barbot in France and by Major Wright in England have captured the imagination of the public, and aroused general interest in practical flying. So long as the man in the street knew that if he wanted to fly his own aeroplane he would be called upon to pay anything from £500 upwards for his machine, he was not greatly interested in the subject. A light two-seater motor-car at less money could carry him and his family at moderate speed anywhere within reason that he might wish to go. But prove to him that the cost need not be more than somewhere between £100 and £150—or, in other words, the price of a powerful motor-cycle and side-car—and the man in the street at once begins to prick up his ears.

The Sutherland Prize

This is precisely what has been happening in the case of the flights on the Dewoitine and "Wren" light 'planes, and consequently the announcement of a competition for machines of this type in September is welcomed on all sides as being likely to hasten forward the production of suitable machines very considerably. Up to the present, although it has been known that theoretically it was possible to make light 'planes which would have quite a creditable performance when fitted with engines of very low power, there has not been the encouragement for firms to spend money on experiments without knowing whether or not there was likely to be a market for such a machine when it had been evolved.

The Duke of Sutherland's prize will give a much-needed fillip to the light 'plane movement, and may well prove to be of greater benefit to aviation in general than could have been a similar prize offered for any other purpose. By limiting the engine power to 750 c.c. the purchase price and running costs are at once reduced to a very low figure, and if it can be proved—as we firmly expect it will be proved—that such machines are safe as well as cheap, the immediate result will be a much greater practical interest on the part of the general public. And after all, as it now appears to be generally realised that what we have to do above all other things is to spread the "air sense" and to get the mass of the people to give to the air the same interest and support as it has in the past given to the sea, what could be more calculated to bring about this result than the popularisation of practical flying?

Elsewhere in this issue we publish a brief outline of the form which the competition for the Sutherland Prize is to take. With an engine capacity of 750 c.c. the winner of the competition will be the pilot who covers the greatest distance on 1 gall. of petrol, a limit of 50 miles having been set as the minimum to be attained. Thus, if the prize is won—and there is no reason to doubt that it will be won—the winning machine will be so economical in fuel that it will do better than 50 miles per gall. This is a figure which compares favourably with the consumption of a motor-cycle of the lighter type, many side-car outfits averaging very much less than 50 m.p.g. The fact that the prize is for distance, and not merely duration, should lead to very efficient machines, as a certain speed will have to be maintained in order to cover a maximum distance. Otherwise the prize might have gone to some freak machine with such light loading and low speed as to make it of no use for ordinary flying. The fact that competitors will have to wheel the machine out of a field through an ordinary gateway and a mile along a country road within a certain minimum time should ensure easy dismantling or folding of the wings. As machines of this type will not have a very good climb, this is a very necessary precaution, and we should like to see it further emphasised by awarding points for time saved in covering the stipulated distance. Three hours appears to be an ample allowance, and a suitably designed machine should be capable of having its wings folded and being wheeled the mile in less than half that time. The competitor who succeeds in doing it in half an hour should certainly receive marks placing him ahead of the man who takes nearly the full three hours to do it.

His Grace is to be congratulated upon his foresight in choosing this particular sphere of flying as the field for his encouragement, and we do not doubt that in years to come we shall look back upon his prize and decide that it marked the beginning of real sporting aviation.

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Other Prizes Wanted

While we are duly grateful to the Duke of Sutherland for his very generous and sporting offer, we hope others will come forward with help in the form of prizes for other performances. Thus the question of climb will probably be a rather serious one in the case of these low-powered aeroplanes. A prize or a number of prizes for the quickest get-off would probably be welcomed. In this connection it should be remembered that rate of climb—as we know it in high-power machines—will not be much use as a criterion. What matters is the climbing angle and the speed. As the climbing speed will probably be low, the climbing angle may not be so bad, although the rate of climb is low, and the low speed would probably enable a pilot to turn around and land in the aerodrome, should his engine fail as he is taking off.

Controllability is another great factor, and if some competition could be devised for effective control, especially at or near the stalling speed, much good would be done.

In this connection we think the Air Ministry might come forward and offer a certain amount of prizes, as the light 'plane offers great possibilities of research at low cost, as well as of economical training of pilots. We might, perhaps, venture to suggest that £1,000 taken away from the money it is intended to waste on helicopters would do an immense amount of good, if judiciously spent on the encouragement of the light 'plane. Also it would be a graceful act if the present minimum fee of £65 for an air-worthiness certificate could be reduced to about £5 or so. At present the fee is hampering development very seriously, and frankly there is no reason whatever to make such an exorbitant charge for the checking of a few stress calculations.

We have called attention to this matter on several previous occasions, and this would seem to be a good opportunity for the Air Ministry to make an announcement to the effect that in future the fee will be drastically reduced.

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The FLIGHT Designing Competition

As announced on another page of this issue of FLIGHT, our £25 prize has been divided between the designers of "Turkey Buzzard" and "K_L." The judges did not consider that any of the competing designs merited the full amount. One of the judges was not in favour of awarding any prize to the designer of "K_L," as he did not consider it likely that it would be a very efficient glider. In view of the work spent on getting out the designs we have, however, thought that a certain amount of recognition should be made, and have therefore decided to divide the prize.

We quite agree that "K_L" is not likely to be very efficient, but it should have controllability, which is quite as important. "Turkey Buzzard" will probably need larger control surfaces, but should otherwise be a very good glider. In its design, as will be seen when we publish the construction drawings, a minimum of metal fittings is employed, which is a great advantage for amateur construction.

The publication of working drawings will occupy a good deal of space, but we shall endeavour to publish the complete drawings as soon as possible so as to enable prospective amateur constructors, should they wish to take part, to get to work on the FLIGHT designs and finish in good time for this year's glider competitions, which it is intended to hold in connection with the September meeting for the Sutherland Prize. An excellent opportunity to attempt the flight for the Selfridge Prize of £1,000 during this meeting also presents itself, and it should be possible to do this at low cost, as hangar accommodation will be available and official observers present without extra charge.

FLIGHT

"FLIGHT" GLIDER DESIGNING COMPETITION

Prize Divided Between Two Competitors

AFTER a long, but unavoidable, delay we are able to announce this week the result of the designing competition instituted by the proprietors of FLIGHT, who offered a prize of £25 for the best design for a glider submitted for competition. The work of going through the stress calculations and aerodynamic estimates has been very considerable, and in this connection we wish to express our appreciation of the assistance so unstintingly given by Mr. F. Handley Page and Mr. C. R. Fairey, who have acted as judges of the designs, giving absolutely without remuneration much of their valuable time in order to further the good cause. We also desire to place on record our indebtedness to Mr. Duncanson, of the Fairey technical staff, who has spent a great deal of time in examining the drawings, checking stress calculations, etc. In fact, without the generous help of these gentlemen it would have been impossible for us to have held the competition at all, so that our readers, no less than we ourselves, are very grateful for the assistance which has made the competition possible.

The Awards

It has been a matter of considerable difficulty to decide upon the award of prizes, and while one of the judges was inclined to give the £25 to the designer of "Turkey Buzzard," the other was strongly of the opinion that none of the designs submitted deserved the full prize, as no single design incorporated the two features essential in a modern glider—*i.e.*, (*a*) good gliding angle and low rate of descent, and (*b*) manœuvrability.

In light airs the machine with a low rate of descent will be able to remain aloft when the machine with a poor gliding angle can only make an ordinary glide. This was demonstrated at Biskra, where, one day, the Peyret glider was only able to make an ordinary glide, although another machine, a monoplane of the Dewoitine type, was able to remain up for four hours.

On the other hand, Maneyrol's performance at Itford demonstrated that, given sufficient wind, the machine which possesses controllability can manœuvre quickly, and thus remain in the rising currents when the more refined but less manœuvrable machine slips out of the current before the pilot can manœuvre it into position again.

In view of the great amount of work involved in getting out the competing designs, the Editor of FLIGHT has decided that this merits award, even if the view is taken that no design is any great improvement upon the machines competing at Itford last year, and we have, therefore, decided to divide the £25 prize equally between "Turkey Buzzard" and "K_L," whose identity at the moment we do not know. The envelopes containing the names and addresses of competitors have not yet been opened, nor will they be opened until this week's issue of FLIGHT is in the hands of our readers. The names and addresses of competitors will then be ascertained, and cheques sent to the two winners. Our consolation prize of £10 will not be awarded, as, in the opinion of the judges, no design was sufficiently original to merit the prize.

"Turkey Buzzard" is a monoplane, with the wing raised above the fuselage. It is a clean design, but open to the objection that the control surfaces will probably be found to be rather small. "K_L" is a biplane, and will probably not have a very good gliding angle, but has large control surfaces, and should, therefore, be very quick on the controls. General arrangement drawings of the two winning designs are published in this issue, and the drawings of some of the unsuccessful designs may be published in subsequent numbers of FLIGHT, as it is possible that they may appeal to certain amateurs, although they did not impress the judges as being most generally suitable.

It is not proposed to publish in detail the stress calculations accompanying the designs, as these would take up rather more space than we can afford, but they have been checked by competent men, and may be assumed to have indicated that the various members of the winning designs are of sufficient strength for the work they have to do, and show a factor of safety sufficiently large to ensure against breakage under ordinary manœuvres. The calculations are kept at our office, and may be inspected here by anyone contemplating to build from the published drawings.

We would point out, however, that it is essential that all materials used should be according to specification, and should, moreover, be in first-class condition. We must also emphasise that, although every care has been taken to ensure adequate strength, neither we nor the designers can accept any responsibility for any breakages occurring. So much depends upon the manner in which the machines are built, the workmanship put into them, etc., and as the work will not be under our supervision we cannot accept any responsibility. With ordinary care in construction and inspection of materials, etc., there is no reason to suppose that the accepted designs are not amply strong for their work, and no fear need be entertained on this score.

Brief Descriptions of the Winning Designs

Next week we hope to commence publication of the constructional details, etc., of "Turkey Buzzard," to be followed later by the details of "K_L." In the meantime the following brief descriptions of the two designs may be of interest.

THE TURKEY BUZZARD

General Description

The following description accompanied the design of the "Turkey Buzzard":—

"The 'Turkey Buzzard' is a semi-internally braced monoplane. The wing is placed above the fuselage for two important aerodynamical reasons: first, because this position minimises the mutual interference between the wing and the fuselage, and, second, useful lifting surface is utilised with the wing passing over the fuselage instead of through it. Structural simplicity is maintained by not breaking the fuselage fairing and the wing profile. The short lift-struts greatly reduce the weight of the wing beams, and do not offer much head resistance.*

"The plan form of the wing is tapered to improve the aerodynamical efficiency and to reduce the structural weight. The profile is tapered solely for aerodynamical reasons.

"The ribs employed are of stiff paper, reinforced with wood capstrips and stiffeners which are cemented on by means of dope. This type of rib is extremely light and strong. An experimental rib of six-foot chord weighed only 0·22 lb. and stood a test load of 264 lbs. before breaking. This corresponds to a load factor of about 25 g. on a machine as lightly loaded as the 'Turkey Buzzard.'

"The fuselage fairing is a modification of a dirigible form. The cross-sectional area is proportional at each station to the cross-sectional area of the dirigible form, but the shape of the cross-section is modified to suit structural considerations. The corners of the cross-section are rounded to conform to a sine curve.

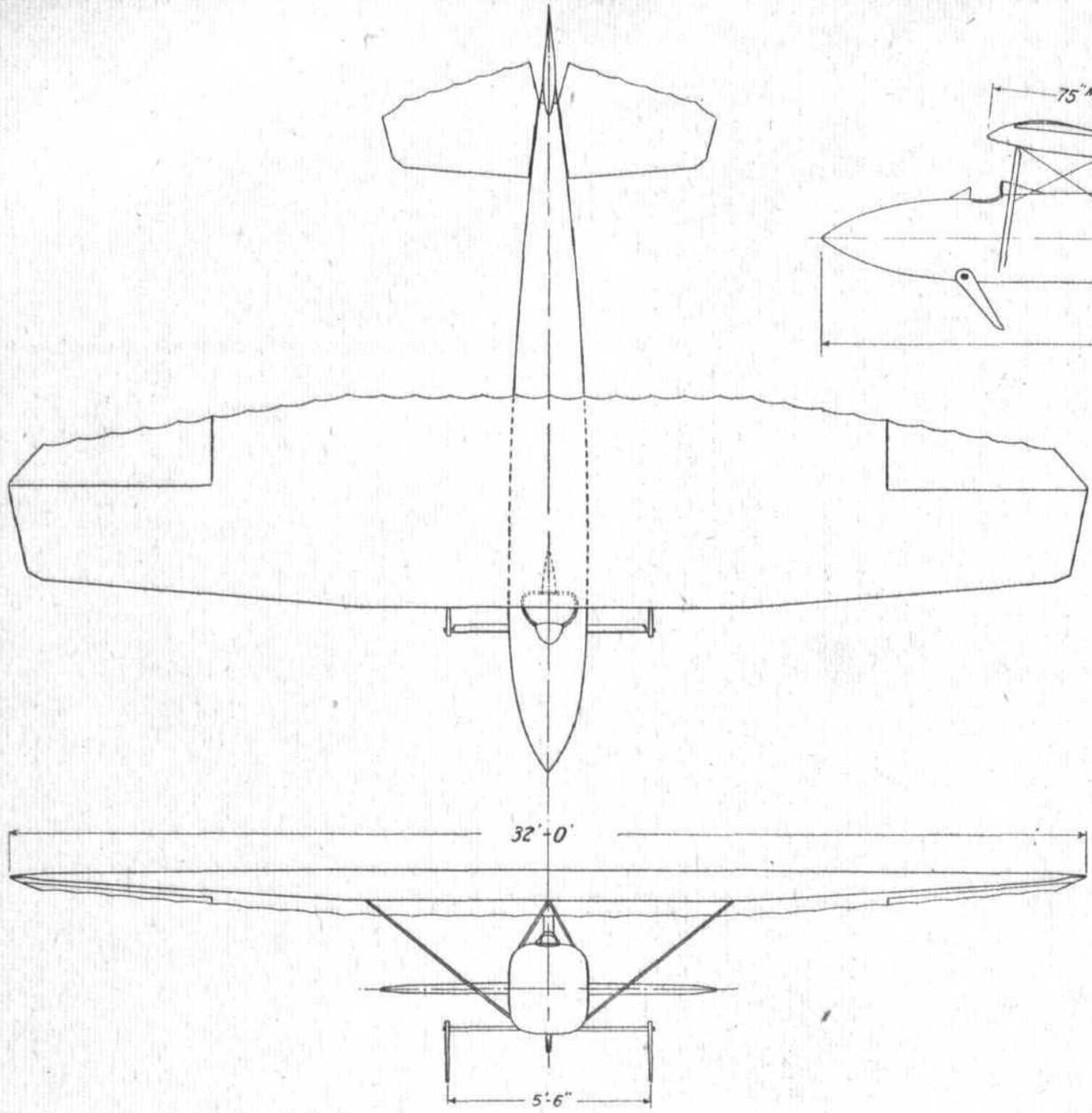
"No fixed tail surfaces are used. The movable surfaces are internally braced and are balanced. For ease of construction the rudder is made with the same profile as the outboard portion of the elevators.

"No construction drawing is provided for the rudder, since the construction is so nearly like that of the elevators. Beams similar to the outboard portion of the elevator beams should be used. The lower ends may best be drawn down to fair in with the fuselage. Ribs 2 to 6 inclusive of the elevator should be duplicated on the rudder. Ribs 2 and 3 will have the noses lopped off. The horns should be similar to those used for the elevators, and should be attached to rib No. 3. All the ribs will be of a construction similar to those employed in the wing.

"The greatest practical difficulty which has been experienced with internally braced surfaces is their tendency to flutter, due to their weakness in resisting torsional deflection. In the 'Turkey Buzzard' the wing and tail surfaces are each provided with two sets of drag bracing, one near the upper surface and one near the lower surface. The two beams and drag bracing form a box truss which should be very effective in resisting torsion and should increase the strength of the wing by equalising the distribution of load between the front and rear beam. Tests on internally braced wings having two sets of drag bracing have borne out this assumption.

"The efficiency of the ailerons may be improved by cementing strips of sheet rubber over the cracks at the hinges. This

* Throughout the article the designer of "Turkey Buzzard," following American practice, uses the word "beam" where we use "wing-spar."—ED.

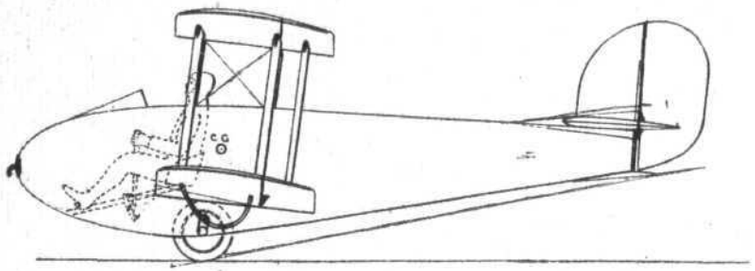


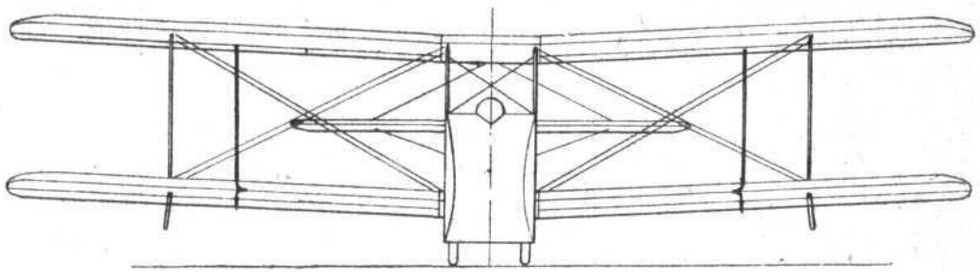
CHARACTERISTICS

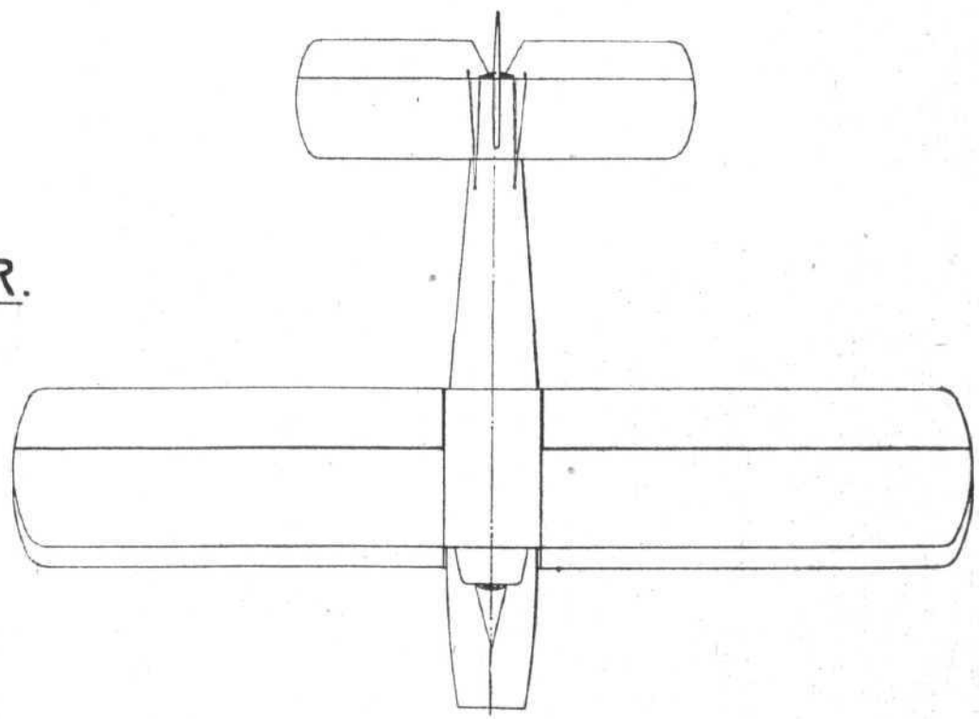
SPAN = 32'-0"
MAXIMUM CHORD = 75"
MINIMUM CHORD = 48"
AEROFOIL { GÖTTINGEN 426 / SLOANE CURVE
TAIL SECTIONS · · GÖTTINGEN 410
AREAS.
MAIN PLANE = 172 SQ. FT
ELEVATORS = 22.4
RUDDER = 8.7
AILERONS = 18.3
LENGTH = 22-8"
WEIGHT EMPTY = 150 LB.
LOADED = 300 LB
SURFACE LOADING = 1.74 LB./SQ.FT

TURKEY BUZZARD
GENERAL ARRANGEMENT

"TURKEY BUZZARD": General Arrangement Drawings, to scale.







"KL"

BIPLANE GLIDER.

TOTAL WT	335 LBS
WEIGHT LIGHT	175 LBS
AREA PLANES	184 ϕ
AREA AILERONS	63 ϕ
CHORD & GAP	4 FT
INCIDENCE	7°
DIHEDRAL	3°
TOTAL TAIL PLANE	25 ϕ
ELEVATORS	9 ϕ
FIN	3 ϕ
RUDDER	5 ϕ
SPAN	24 FT
LENGTH	17'-6
HEIGHT	6'-3

"KL" BIPLANE GLIDER : General Arrangement Drawings, to scale.

feature would be less desirable in the case of the rudder, because it may be necessary to remove the rudder more often.

"The landing gear consists of two main skids and a tail skid. The two main skids are placed well forward of the centre of gravity. They are mounted on the ends of a torque tube, which transmits the rotational deflection to a shock absorber located inside the fuselage. This arrangement permits quite a wide track for the landing skids. The skids are hinged to the tube by means of vertical pins. This feature tends to relieve any side thrust, and minimises the possibility of overturning, at the same time greatly reducing the racking stresses. The tail skid follows more or less conventional practice."

Without going into detailed criticisms of the structural design, which we hope to deal with when the construction drawings are published, a few comments upon the general design of "Turkey Buzzard" may not be without interest here. The drawings are, almost without exception, very neatly and carefully done, and arranged to proportions of the pages of FLIGHT as called for in the rules governing the competition. In fact, quite apart from the merits of the design, "Turkey Buzzard's" drawings were the cleanest and best sent in. That fact has naturally been taken into account, although if another design had been superior—as a glider—but the drawings poor, this fact would not have caused the better design to be discarded in favour of the other. As it is, however, "Turkey Buzzard" combines good drawing with reasonably good design.

One or two points in the design we do not quite like. Reference has already been made to the somewhat small control surfaces, and we think that anyone intending to build from the drawings would be well advised to increase the size of ailerons, elevator and rudder.

From the point of view of efficiency, the aspect ratio of the wing is not as high as it might have been, and we are not quite in agreement with the designer when he assumes an equivalent aspect ratio of 10·7. However, that is a point to which we hope to return in a subsequent issue, when the performance calculations are published.

The undercarriage we frankly do not like at all. To begin with, the large overhang to give a wide track would be a source of weakness, as the beams are cantilevers with a concentrated load at the end. The shearing force would be considerable, and the beams would need to be fairly heavy. Secondly, the use of skids of the tail skid type was found at Itford to be undesirable. The "Airdisco" monoplane was fitted with two Bristol Fighter tail skids on the main undercarriage, and it was found impossible to drag the machine off the ground until wheels had been substituted for the skids.

In other respects the design appears clean and of good lines, and although we doubt if the gliding angle of 1 in 20 estimated by the designer will be realised, the machine should be quite a good glider and have a fairly low rate of descent.

"K_L" BIPLANE GLIDER

The following short description accompanied the drawings submitted by "K_L":—

"The design comprises a fuselage biplane with monoplane tail. The pilot is seated on the lower front spar, and has a good view forward and downward, while being very well protected in a bad landing.

"The fuselage is constructed of birch 3-ply 1 mm. thick (which is obtainable), stiffened by spruce struts and occasional wire or gusset bracing. This construction has been chosen as being easy to build, especially in quantities; it is very strong, does not get out of truth, is cheap and light, and is good in torsion.

"The planes are not remarkable for their construction, being an ordinary 'one strut out' job with spruce spars stiffened against lateral failure by a ply nosing. The ailerons are hinged at ·35 chord, and act as flaps as described later.

"The undercarriage is merely a cross axle carrying a pair of Palmer wheels, 450 × 60 mm. The axle works in a slot in the fuselage, and is sprung by rubber. A light ash tail skid is fitted. Towing and launching hooks are provided at the nose of the body.

"The tail plane, elevators, fin and rudder form a self-contained unit, readily removable, since the rudder is not hinged on the fuselage sternpost. The seat and controls in the cockpit also form one easily removed unit. The rudder is controlled by the usual bar. The control is a frank copy of the 'Peyret' Glider control, but whereas the Peyret was a tandem monoplane of problematic efficiency, it is claimed that the present arrangement has the advantage of quick control laterally and longitudinally upon an aerodynamic assembly which is of known behaviour. The essential of the control is that, as is to be gathered from Diagram No. 1, the elevators act with the ailerons for lateral control, while the ailerons work with the elevators for longitudinal control. It is in order to get as large an aileron effect as is practicable, that the tail plane has been given such a large span. The lower ailerons only are coupled to the joystick, the upper pair being actuated by a strut connecting upper and lower aileron.

"An attempt has been made to keep the number of fittings down and to make them simple. Bending has been avoided, as if the machine is to be made by amateur fitters, it seems wise to avoid the necessity for annealing. Eyebolts are freely used, but are kept down to as few different kinds as possible.

"The gliding angle is not remarkable, it is true, but it is good enough, and it has been thought better to give attention to a robust structure and aerofoil sections whose habits are known, than to attempt a super-efficient glider on an aerofoil of problematic credentials and possibly requiring expensive methods of construction.

"It should be pointed out that the whole machine should be able to be dismantled very quickly, as all attachments are by pins or bolts."

The following comments on "K_L" by one of the judges should be carefully studied:—

"It is pointed out that the use of the Peyret control system on a glider of this type would give unsatisfactory results, for the reason that, if the ailerons operate in conjunction with the elevators as proposed, when the ailerons are brought down a great fall off of lateral control will be experienced. This effect will be all the more marked on the wing section chosen, which is ·08 camber with flat undersurface and, therefore, of fairly high lift, as the fall off of lateral control in arrangements of this type is greater with high lift than with low lift wings.

"If it is proposed to adopt a very strong fore and aft control it could be accomplished more readily by a slight increase of tail plane and elevator area. Also the effect of warping the elevators with the ailerons could be obtained quite easily by a slight increase of the span of the main planes.

"There is a great deal of uncertainty as to whether the proposed arrangement would be correctly proportioned for control in the stalled and landing conditions. In the case of the Peyret glider, the C.G. position and other features of the design lent themselves better to the adoption of that particular type of control, which would not necessarily be successful on another design of glider. *From all points of view it would be safer to adopt a more usual type of control.*

"No general arrangement of details of the control system are shown, and it is pointed out that these are among the most important features of any design.

"The general design of the wings is very good. It would be possible, without affecting the cost of production, to increase the rounding of the wing tips, with corresponding improvements in the airworthiness of the glider.

"The spar design might be simplified by substituting plain rectangular sections, taking advantage of the leading edge stiffening and the fact that the spar stresses are low.

"The aileron spar design is good but expensive, and might be simplified with advantage. The general layout of the machine is practical, and the constructional methods proposed are commendable."

To Golf by Air

A LONDON business man who flew to Le Touquet on Good Friday by taxiplane wired to the Lepaerial Bureau to send a special aeroplane to pick him up at the golf course there and bring him to London. Desiring to play in an amateur tournament that morning, and having an important business appointment in the afternoon in London, he found that the only way by which he could keep both fixtures was to make use of the taxiplane. There has been a considerable increase in the demand for these machines; in fact, during the last few weekends every available taxiplane has been in use for journeys to all parts of England and the Continent. The latest machine to be added to the Lepaerial fleet of taxi-planes is the machine which won the King's Cup Race last year. This aeroplane, piloted by Capt. F. L. Barnard, took a passenger last week from London to Melton Mowbray, back to London, and from London to Paris in a total flying time of less than four hours.

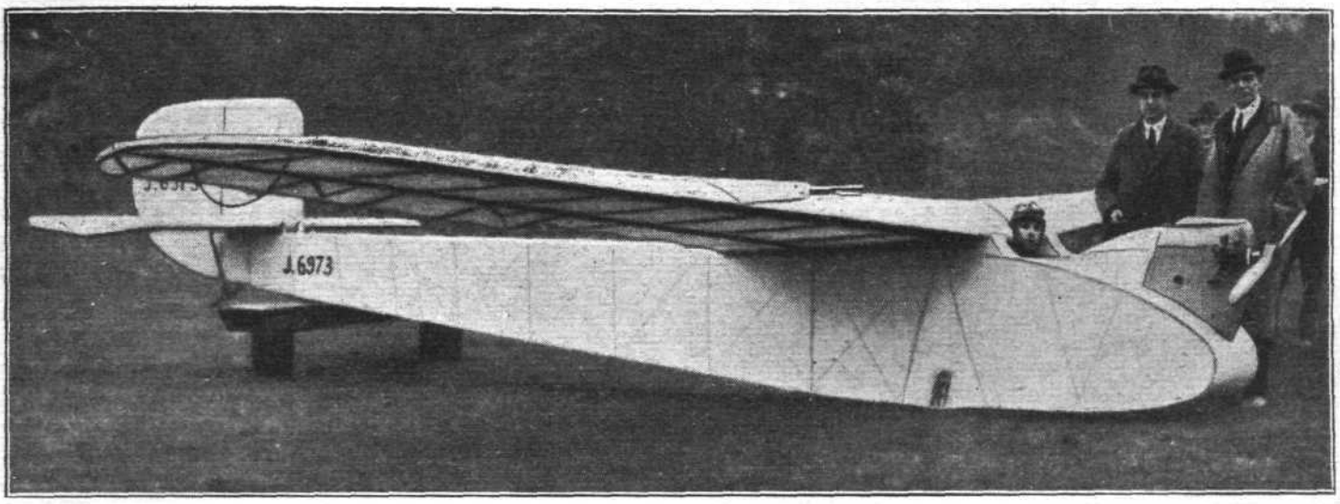
FLIGHT

LIGHT 'PLANE AND GLIDER NOTES

Elsewhere in this issue of Flight will be found particulars of the competitions, probably to be held during one week early in September, for light 'planes fitted with engines not exceeding 750 c.c. capacity. His Grace the Duke of Sutherland, Under-Secretary of State for Air, has offered a prize of £500 for the machine which covers the greatest distance on one gallon of petrol. It is expected that other prizes will be offered, and in order to lend further interest to the meeting, competitions for ordinary gliders will also be held. Thus we may look forward to a most interesting and instructive week, which will, we feel sure, mark the beginning of cheap sporting flying. Recent experiments have shown beyond a doubt that it is possible to build a machine which will fly quite well with an engine of very low power, and the prize presented by the Duke of Sutherland will do more towards establishing the "light 'plane," and through that a general and widespread interest in flying, than could have any prize offered for any other purpose. His Grace deserves, for his generous offer, the thanks of all who believe in the future of flying, and it is to be hoped that others will come forward with similar encouragement. If that is done the day will not be far distant when young men by the hundreds will run their own light 'plane.

* * *

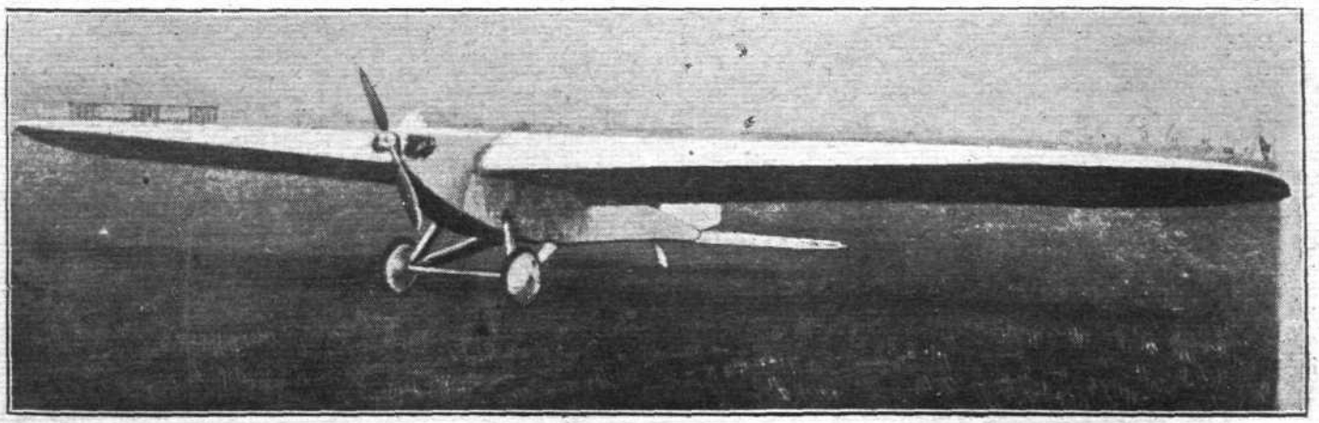
The Royal Aero Club is to be congratulated upon the decision to hold a meeting extending over one week, and to combine glider competitions with the contest for the Sutherland Prize. The two types of machines, although sufficiently dissimilar to warrant a distinct name for the power-driven type, have much in common, and the meeting cannot fail to receive added interest by combining competitions for both types. In the light 'plane type we are pleased to learn that the Royal Aero Club proposes to hold a transport test in which competitors will have to get the machine out of a field through an ordinary gateway and wheel it a distance of one mile along a country road, the whole operation not to take two men more than three hours. This will ensure that designers pay due attention to the question of easy dismantling and erecting, features which had not been sufficiently studied at the Itford competition last year. The importance of being able to wheel a light 'plane along to a suitable field after a forced landing will be realised when it is remembered that this type of machine will not have a very spectacular climb, although it will land very slowly. Thus it should be possible to "put it down" in almost any field with perfect safety, but getting out of a small field surrounded by hedges and trees may be more difficult, and in many cases it will probably be necessary to look around for a larger field and to wheel the machine to it in order to get away again. Hence the necessity of being able to fold or dismantle the wings and wheel the machine along the road if need be.



THE "WREN": This astonishing light 'plane has been designed by Mr. W. O. Manning and built by the English Electric Co., of Preston, Lancashire. The engine is a 400 c.c. A.B.C. motor-cycle engine developing about 7 h.p. at 4,000 r.p.m. When the "Wren" was flown by Squadron Leader Maurice Wright last week-end the engine was never opened out fully.

* * *

The September meeting for gliders and light 'planes will provide a good opportunity for those who are contemplating to attempt to win the Selfridge £1,000 Gliding Prize (50 miles measured in a straight line), as the site for the competition will probably be somewhere on the Downs. Official observers will be present and tent accommodation for machines be available. Thus the expenses of competitors should not be great, and the Downs probably offer as good conditions for the flight as anywhere in England. The Selfridge Prize may, of course, be competed for anywhere, but the September meeting will afford a very good opportunity of making the attempt at small cost, especially considering that competitors will have a chance of winning other prizes as well.



By Courtesy of "The Times."

THE DEWOITINE LIGHT 'PLANE: This is the machine on which M. Barbot has been flying recently at Toulouse.

BARBOT, who will be remembered from Itford, where he was to have flown the Dewoitine monoplane but for an unfortunate accident in starting, resulting in the machine being known ever after as the "Do-it-in," has been making history with his motor-driven Dewoitine. On April 3 he made a short straight flight on the machine, which is fitted with a 7-10 h.p. motor-cycle engine. The next day he took it up to a height of about 1,500 ft., and, deciding to make a cross-country flight of it, flew from the Francazal aerodrome to Toulouse. After circling over the town he landed in the street in front of the Dewoitine works. It is stated that the machine requires but 4 h.p. to keep it in the air, and that the maximum speed is about 60 m.p.h. In general lines the Dewoitine is similar to the machine at Itford, which was, it will be remembered, of extremely clean design, with its cantilever bird-shape wing and streamline fuselage. A simple two-wheeled undercarriage is fitted.

IT seems probable that Barbot's next venture will be an attempt to win the prizes offered by Blériot and others for a double crossing of the Channel on a minimum of petrol consumption. The Blériot prize is for the pilot making the double crossing on the smallest amount of petrol, not exceeding 3 litres (a little over 5 pints). In a calm, and with a machine doing about 60 miles to the gallon, it should just be possible to make the double flight.

* * *

IN the meantime we in this country have not been quite idle either in the matter of light 'planes. In our issue of March 29 we described the light 'plane designed by Mr. Shackleton for the Air Navigation and Engineering Co. of Addlestone, which is designed for a Bristol "Cherub" engine. Mr. W. O. Manning has designed for the English Electric Co., of Preston, Lancashire, a small light 'plane fitted with a two-cylinder A.B.C. motor-cycle engine, nominally of 4 h.p., but developing about 7 or 8 h.p. This machine was tested by Sqdn.-Ldr. Maurice Wright over the week-end, first in a few straight flights and, on Saturday, April 8, in a flight of seven minutes' duration. The machine got off into a very strong wind, and behaved very well, answering its controls satisfactorily and flying at a little over 40 m.p.h., although the engine was not opened out fully.

* * *

THE "Wren," as Mr. Manning's design is called, is an ordinary glider in appearance, with enclosed fuselage, a cantilever wing with a pronounced dihedral, and the undercarriage nearly hidden inside the fuselage. The pilot sits in front of the wing, and the A.B.C. engine is mounted in the extreme nose and drives a tiny tractor screw, apparently driven direct. With high revolutions and a propeller of low pitch-diameter ratio it should be possible to get an efficiency of about 70 per cent. at a forward speed of 50 m.p.h. Although better efficiency might be obtained by gearing down the airscrew, the simplicity of direct drive and the small diameter allowing the machine to be low on the ground are points in favour of the direct drive. Also the undercarriage, as has apparently been done, can be enclosed in the body, with the exception of the lower half of the wheels. With a large-diameter propeller this would not be possible.

* * *

ONE feature in the design appears a little curious. It will be remembered that Raynham found his glider a little nose-heavy, although he was placed between the wing spars. In the Manning glider both the pilot and the engine are in front of the wing, and although the centre of pressure may not be so far back as in the Göttingen section of Raynham's machine, it might be thought that the machine would be nose-heavy. The explanation may be that the tail is set at a large negative angle. At any rate, the machine appears to fly well, and within limits probably better stability is obtained by having the weight well forward, especially as a large speed range is not aimed at.

* * *

THIS week we publish the general arrangement drawings of the two designs among which the FLIGHT prize of £25 has been divided. In subsequent issues we propose to publish the constructional details, performance estimates, etc. In view of the forthcoming competitions, there may be several who would like to build their own gliders, but who do not quite know how to set about it. To such the FLIGHT designs should be of assistance, and it is intended to publish not only the winning designs but also a few others, so as to give amateurs a greater choice. The designs accepted have been thought by the judges the most generally suitable, but personal preferences might lead some to choose other designs. The publication will take up considerable space, but we shall endeavour to publish the drawings in as few issues as possible so as to enable intending builders to get started in good time for the year's competitions.

LIGHT 'PLANE AND GLIDER COMPETITIONS

THE Royal Aero Club will organise in September next a Light 'Plane Competition, open to machines fitted with engines the total cylinder capacity of which must not exceed 750 c.c.

It is proposed that the starts should be made off a hill, and a triangular course of not less than 15 miles with a range of hills on one side will be used.

One gallon of petrol only will be allowed, and the weight of the pilot must be made up to a minimum of 168 lbs.

In addition to the actual flying the question of transport will be considered, and competitors will be required to demonstrate that the machine is capable of being transported a distance of one mile by two persons without the use of extraneous tackle, in a period not exceeding three hours. The selected course for this test will include getting out of a field through an ordinary gateway and proceeding along a country road.

The competition will probably extend over a week early in September.

The Duke of Sutherland, Under-Secretary of State for Air, has given a prize of £500, through the Royal Aero Club, for the longest flight in this competition (minimum 50 miles), and other prizes will be forthcoming.

In addition to the light 'plane contest, competitions will be arranged for gliders without engines on somewhat the same lines as those held at Itford Hill in October last.

Advantage will be taken of the facilities offered by the Royal Aero Club by certain competitors to make attempts for the Selfridge Gliding Prize of £1,000.

THE DUKE OF SUTHERLAND'S PRIZE

A Welcome Encouragement

THE above announcement by the Royal Aero Club of the offer by His Grace the Duke of Sutherland, Under-Secretary of State for Air, of a prize of £500 for low-power aeroplanes will be welcomed by all who believe in the future of flying for sport and pleasure. That His Grace should have decided to encourage this particular form of flying provides an indication of the extraordinary manner in which he has, within a very short period, grasped the fundamental necessities of aviation, and it is probably true to say that in no other conceivable manner could the prize have done as much for aviation.

If flying is ever to become the popular sport we all hope for, it is essential that every effort should be made to reduce the cost. So long as we stuck to War-time types of machines, with engines of hundreds of horse-power, flying could never become the sport of the many. By stipulating that the engine capacity should be limited to a certain minimum, the Duke of Sutherland has started the ball rolling, and there is little doubt that the result will be quite a crop of low-power aeroplanes.

With regard to the competition itself, it may be argued that a race limited to such distance as may be covered on one gallon of petrol will not be very exciting. The answer to that is, of course, that it is not intended to be. What His Grace hopes to accomplish is to discover, and encourage the production of, a machine which will give a very low petrol consumption. Furthermore, it is to be hoped that now a start has been made others will come along and emulate the example set by the Under-Secretary of State for Air by offering other prizes in connection with the same competition, so that we may have quite a flying week in the autumn.

It may not be without interest to examine briefly how the regulations may be expected to affect design. First of all, there is the difficulty of an engine. The limit of 750 c.c. capacity rules out any engine with which we have hitherto been familiar in the aviation world. It would appear that we shall have to look to the manufacturers of motor-cycle engines for our power plant. Although engines vary tremendously in their efficiency, it may be assumed as a rough and ready guide that every 100 c.c. develops one horse-power, according to the R.A.C. rating. It is also known that this

rating is useless as an indication of the actual power developed, the majority of modern engines developing round about twice the rated power. If, therefore, we assume that an engine of 750 c.c. will develop about 15 h.p., especially after being suitably lightened, with smaller flywheel, etc., we have some rough and ready guide to what average we may expect.

A few preliminary estimates indicate that it should be possible to build a machine to take an engine of this size, weighing in the neighbourhood of 500 lbs. "all up," probably below rather than above this figure. Assuming a power loading of about 33 lbs./h.p. and a wing loading of 4 lbs./sq. ft., it should be possible to get a maximum speed of 60 m.p.h. at least, probably more, a cruising speed of 40-45 m.p.h., and a landing speed of round about 30 m.p.h. The get-off and climb will not be very good with this power loading, but the machine should be able to climb the first 200 ft. in a minute or a little less. In any case, presumably competitors would be allowed to employ catapult starting should they so wish.

The mileage per gallon may be expected to be at least 60, and probably more, and by taking advantage of up currents competitors will be able to save a certain amount, provided the engines can be stopped and started again, or, at any rate, the fuel cut off and turned on again when desired.

The question of speed is very complicated, and there is little fear that all competing machines will be very much alike. For instance, it is possible to argue that a machine with fairly large wings, *i.e.*, light wing loading, will require least power to fly, and will, therefore, be capable of being throttled down to a very small petrol consumption. That is true to a certain extent, although the fact that distance is the object and not duration will have a very considerable effect on the problem. Thus, in perfectly still air there will be one power and wing loading which will give the greatest range for a gallon of petrol, while machines with higher or lower speeds will cover shorter distances, the one because it is using too much petrol in overcoming the resistance at the higher speed, and the other because, although it uses very little fuel in a given unit of time, it also covers a very small distance in a given unit of time.

On the other hand, if there is a fairly strong wind blowing, the faster machine will do best, even over a triangular course. It is often assumed that wind does not much matter, and that "what you lose on the swings," etc. That this is not so will, of course, be obvious if we take an out-and-home race and assume that the wind is blowing towards the starting point. If one of the machines is so slow that its speed is only just equal to the wind, it will not be able to get to the turning point at all. The very fast machine, of course, is but little affected. Consequently, it is impossible to say beforehand that any one machine will cover the greatest distance. This is all to the good, as it gives all sorts of machines a chance, and there will be ample scope for our designers in producing the machine which is likely to cover the greatest distance under all conditions.

Apart from any supplementary competitions that may be arranged, the competition for the Duke of Sutherland's prize should be worth watching, if for no other reason than that competitors will be liable to run out of petrol at any time, and we may expect some very amusing landings.

Another thing which will add variety will be the way in which competitors tackle the problem, some preferring to fly low so as to be able to take advantage of air currents, while others will fly fairly high, particularly when their fuel is beginning to run low, in order that the range may be extended by a good long glide when the engine peters out.

Altogether, we can foresee quite an amusing week on the Downs. It is rather unfortunate that the event has been fixed for such a late date, but probably this was inevitable if constructors were to have time to produce the necessary machines.

LONDON TERMINAL AERODROME

Monday evening, April 9, 1923

The Easter holidays contributed largely in keeping the passenger traffic fairly high for the time of the year, but, quite apart from this, there has been a big influx of air travellers on the London-Paris route, and to some extent on the London-Cologne and Manchester-London-Amsterdam routes. Handley Page Transport had practically full loads on all machines throughout the week, and began experiments in running one machine to Paris and back in the course of a single day. On the first occasion the machine was so late in starting from Paris, not leaving until about 5 p.m., that it was unable to reach Croydon the same night, but on Sunday the machine which left Croydon for Paris at 12 noon was back again the same evening.

The French Air Union are experiencing a big boom in traffic, having two or three machines daily in each direction, while on Saturday, I understand, there were no fewer than 76 passengers wishing to fly from Paris to London. Five Goliaths were employed to deal with the bulk of these passengers.

Moving the "Cone" Light

Mr. Watson, of the Gas Accumulator Co., was down at the Aerodrome during the week in connection with the alteration in position of the "Cone" Light. This has been moved from its position near the General Offices to the far south-east corner of the Aerodrome, and as the whole of the lights in this piece of apparatus are operated by electricity a special heavy cable has had to be run right across the Aerodrome to feed it. Mr. Watson tells me that the flashing lights at Tatsfield and Cranbrook are giving every satisfaction, and have, in fact, proved even a greater success than was anticipated.

In connection with the growing demand for electric power at the Aerodrome, a new scheme of supplying the various sheds and lights has been devolved, and is now being put into practice. Heavy cables are being brought from the Central Transformer House at the side of Plough Lane and run out to big distribution boxes situated at various parts of the Aerodrome, and from these smaller cables laid to the various points where a supply is needed. These are all being laid underground, and it is probable that in the near future all the overhead wiring round the Aerodrome will be brought underground.

Capt. E. D. C. Herne, who has been with the Daimler Airway since its inception, is leaving them in the course of a few days in order to go to America, where he will be engaged in "sky-writing." His machine, an S.E.5, has been sent on ahead by boat. He is quite enthusiastic over the prospect of life in California, where, I understand, he is to carry out most of his "sky-writing" work.

An interesting billiards match was played at the Trust House on Friday, when a team from the Croydon Police Sergeants' Mess came down to play a team of six from the Aerodrome. The Aerodrome team, the personnel of which was Mr. Shaw, Mr. Muir, Mr. Knight, Mr. Marchmont, Mr. Kirkland and Mr. Herne, won by the comfortable margin of a score of 600 against the police sergeants' score of 118. A very enjoyable evening was spent, and the thanks of all are due to Mr. Lloyd, the Trust House manager, in whose hands the arrangements rested.

The Air Service to Berlin

Major Woods Humphery, General Manager of the Daimler Airway, is at present in Berlin making final arrangements for the inauguration of the Manchester-London-Berlin air service, which is at present fixed for April 16. Capt. Hinchcliffe is to take the first machine, which, it is expected, will start from Manchester about 6 a.m., carrying press representatives, and, flying by way of London, Amsterdam, Bremen, Hamburg and Berlin, will arrive at the latter city before sunset. At present it is not definitely decided whether one or two machines a week shall run through to Berlin, but in any case it is expected that there will be a connection at Amsterdam with German machines.

The fine weather has brought large crowds of sightseers to the Aerodrome for the holidays, and to some extent through the week, and the Surrey Flying Services had a busy time catering for the numerous joy-riders. Joy-riding was also brisk on Saturday, but the strong east wind which sprang up during Sunday morning spoilt the business for the rest of the week-end.

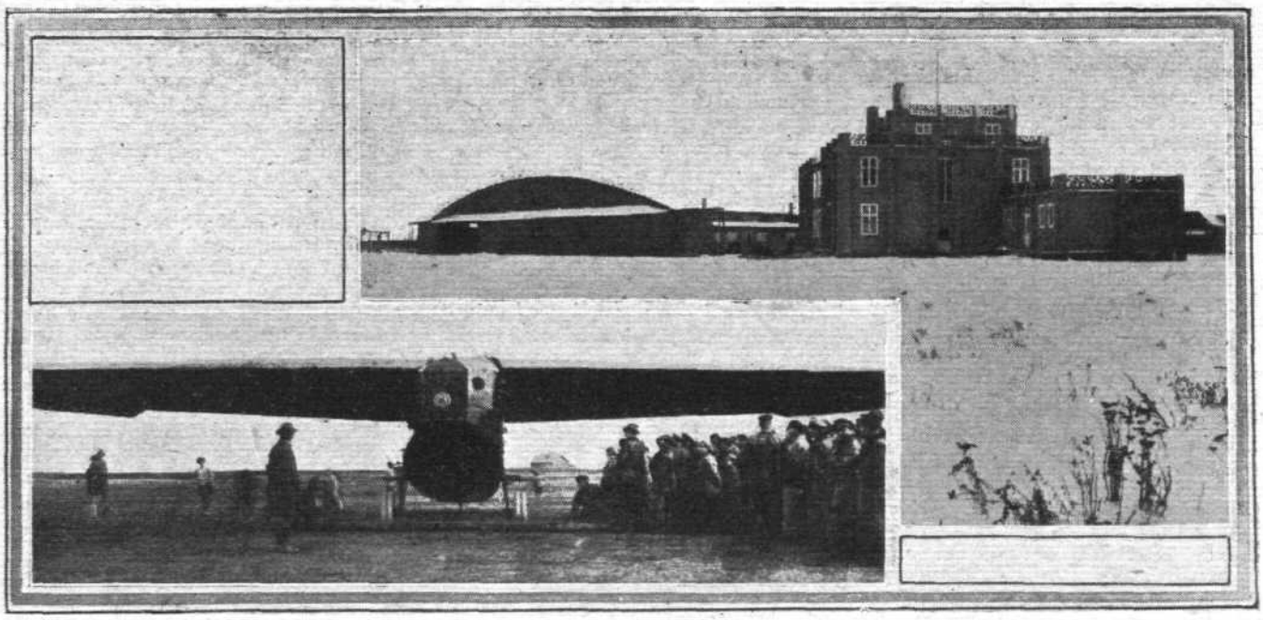
The K.L.M. continue to carry large quantities of goods between London and Amsterdam, and are also accommodating a goodly share of the passenger traffic on this route. It is noteworthy that the passengers both by the K.L.M. and Daimler are practically all business people, as contrasted with the pleasure-seekers who form the bulk of the traffic on the London-Paris route. In fact, the officials of the K.L.M. and Daimler are beginning to know the bulk of their passengers owing to the frequency with which they make the trip in connection with their business.

CIVIL AVIATION IN RUSSIA

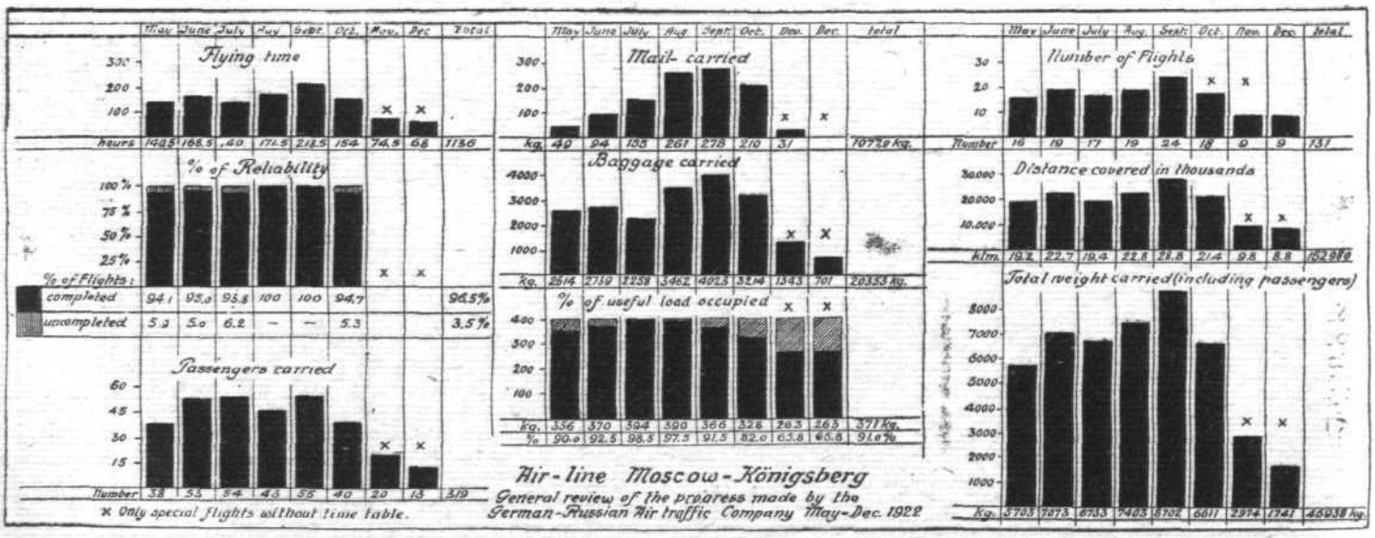
About this time last year negotiations took place between the Russian Soviet Government and certain German aircraft concerns, with a view to establishing an aerial service between Berlin and Moscow. As a result a company was formed known as the Deutsch-Russische Luftverkehrs-Gesellschaft, or, in plain English, the German-Russian Air Traffic Company. In May last the first service was inaugurated, between Königsberg and Moscow, in connection with the train service from and to Berlin. Since then this service has been running regularly, and we have received some interesting figures relating to the number of flights made, loads carried, etc. These are shown graphically in the accompanying diagrams, from which it will be seen that this service has proved to be a very successful one. The route is divided up into two stages, stops being made at Kowno and Smolensk, the necessary agreements having been made with the States of Lithuania and Lettland, through which the line passes. The total distance is about 700 miles, the first stage, Königsberg-Kowno, being 143 miles, and the second and third stages, Kowno-Smolensk and Smolensk-Moscow, are 363 and 239 miles respectively. In order to equalise the division of these stages it is intended this year to extend the first one eastward. At present there are wireless connections between Königsberg-Moscow, and Smolensk, but only ordinary telephone between Königsberg-Kowno. The aerodrome at Königsberg has a well-equipped workshop where engines are overhauled and aeroplanes repaired, etc. The aerodrome at Kowno, however, is but poorly equipped, and is used mainly as an intermediate stop for refuelling. The aerodromes at Smolensk and Moscow are developing gradually. Moscow serves as a central station for additional lines in Russia—Moscow-Charkow, a distance of 435 miles, being one of these—and, therefore, the importance of this aerodrome increases steadily.

A regular service—twice weekly—was maintained on this line from May 1 last until October 31. After November 1 the company could not guarantee a regular conveyance of passengers and mails on account of the foggy weather, and the line was "officially" closed. Special flights, when occasion demanded, were, however, made in both directions. In summer the journey is completed, without change of machine, in one day, but a stay overnight in Smolensk is necessary in winter.

Since February 15 last the Deruluft company has organised a Fair Service between Kiew-Charkow in connection with the Fair (at Kiew ?), which ran until April 1, and the experience which the company will have obtained on this service during the very unfavourable weather conditions prevailing at this time should be of considerable value for future services.



CIVIL AVIATION IN RUSSIA: On the left, some Fokker monoplanes (Rolls-Royce engines) at Smolensk aerodrome, and, on the right, the hangars at Königsberg.



CIVIL AVIATION IN RUSSIA: Statistical diagrams of the Moscow-Königsberg line.

RUSSIAN AVIATION OF TODAY

IN view of the many rumours of German activity in Russia, the following extract from *Novoje Vremja*, quoted in the Czecho-Slovak aviation journal *Letectvi*, may be of interest

The German industrial domination of Russia after the signing of the Peace Treaty is also visible in Russian aviation. The Germans are furnishing aeroplanes to Soviet Russia, beginning to develop aerial lines and to build factories specially designed for giant aeroplanes. The aviation of Soviet Russia is beginning to wake up under this vigilant German eye. War aviation forms a special group of the aerial fleet under the direction of the General Staff. This aerial fleet is divided into five independent units or squadrons. Each squadron can depend on supplies, and therefore can fulfil all requirements. Each squadron consists of two types, reconnaissance and chasers. Each squadron has three groups of two machines. To each squadron belongs one air depôt, two repair trains and two radio stations.

The strength of the force is as follows: In air divisions, 60 machines; in the reserve, 15 machines; total, 75. The personnel numbers 1,765.

The squadron headquarters are placed in Moscow, Smolensk, Kieff, Odessa and Charkoff. There are 2½ squadrons in Russia capable of flying, and these are placed under:—

1. One squadron under English pilot Bujel (?).
2. Squadron under Shiripkin in Kieff.
3. Squadron consisting of one aerial division at Novgorod.

To guess the size of the aerial fleet is somewhat difficult, because it is not yet in its complete form, but the following figures, showing the state of Russian aviation in July, 1922, give some idea:—

Air divisions (scouts and chasers)	60
Air park	6
Aerial workshops	14
Machines capable of flying	269
Under repair	70

To this number it is necessary to add 25 German machines which, according to agreement, were to be delivered by September, 1922, in Moscow. Moreover, Italy received orders for 100 Ansaldo 5 V.A. 300 h.p., the majority of which have already been delivered.

There is also reason to believe that many machines have been bought in England, because at the end of September a Russian pilot flew an Avro Baby from London to Moscow without landing in Germany.

The appearance in the Soviet Russian aerial fleet of Fokkers, Junkers and Ansaldos certainly strengthens its position. According to the programme Soviet Russia intends to enlarge its aerial fleet by 1926 to 5,000 aeroplanes. The pilots have a special uniform consisting of a black tunic with blue breast cords (similar to Hussars), and receive pay of 300 to 400 million roubles monthly.

The scheme for interior aviation is as follows:—

1. Normal air park placed far in the interior belongs to a squadron, where all repairs of machines and motors are carried out. To it belongs train workshops and depôts with spare parts, capable of effecting small repairs.

2. Central park accepts, preserves and guards all air material manufactured in the workshops, and distributes these at given orders to the normal parks.

3. Central head depôt. To it are sent all the materials from all aerial parks which are either destined for repair or destruction. In this central depôt all the material is sorted, cleaned and again delivered according to instructions.

Technical Schools.—The following higher technical schools are in operation:—

1. School of the Russian Red Fleet, which carries the name of Prof. N. E. Zhukovsky.
2. Aerodynamics school (experimental aerodrome).
3. Aerial War Academy.
4. Aerial War High School.

Intermediate Schools.—

1. School of aviation technique (Theory).
2. Practical aviation school.
3. School for technicians and mechanics.
4. School for motor mechanics.
5. Aerial photographic school.
6. Course of photographic aerial laboratory.
7. School for hydroplanes.
8. Preparatory school for pilots (Petrograd).
9. Preparatory school for pilots (Egorjevsk).
10. High preparatory school for pilots (Kieff).
11. Course for air mechanics (Petrograd).

The time of training in the aerial war academy is 2½ years, one of which is a preparatory year, the rest being highly specialised, and this course has again two divisions, one war aviation and war aviation technique.

The students are required, besides attending lectures, to carry out practical flying. At the highest aerial school for the student it is necessary to jump from the aeroplane with parachute (system Kotelnik) from a height of 1,000 metres, and during the descent to fire at an imaginary enemy.

Aviation Literature.—Aviation literature finds its propaganda in Russia through two journals, *The Journal of Aerial Fleet* and a technical journal called *Aerial Work*. The aviation journal is a periodical of 8,000 copies, which are not on sale, but are given to all interested in aviation. It is now the third year that this journal has been in existence. This journal appearing in about 80 pages, has many articles deploring the state of aviation in Russia, and has also a very comprehensive summary of aviation outside of Russia. Besides these, in 1921 there was established a special aviation reference library, which comprised (1) scientific notes, (2) newspapers, (3) foreign literature, (4) lectures, (5) books, (6) book depôt. There is also in preparation for printing, "The Causes of Accidents to Aeroplanes." The material for this publication will be gathered from various workers, and it is intended to give 22 articles dealing with aeroplanes and 40 dealing with pilots. There is a prize given for the various essays.

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THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN MARCH 18 AND APRIL 7, INCLUSIVE

Route (including certain diverted journeys)	No. of flights*	No. of passengers	No. of flights carrying: Mails	No. of flights carrying: Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
						h. m.		
Croydon–Paris	69‡	204	22	43	64	3 4	D.H. 4 G-EAMU (2h. 3m.)	B. (2), D.H. 4 (1), D.H. 9 (1), G. (14), H.P.W.8B. (2), Sp. (3).
Paris–Croydon	59	337	14	36	52	2 41	D.H. 4 G-EAMU (1h. 46m.)	B. (1), D.H. 4 (1), D.H. 9 (1), G. (15), H.P.W.8B. (2), Sp. (3).
Croydon–Brussels–Cologne	21§	74	16	10	20	4 30	D.H. 34 G-EBBR (3h. 39m.)	D.H. 18 (1), D.H. 34 (4).
Cologne–Brussels–Croydon	21‖	97	14	6	19	3 51	D.H. 34 G-EBBW (2h. 45m.)	D.H. 34 (4).
Croydon–Rotterdam ...	16	31	14	15	16	2 42	Fokker H-NABQ (2h. 9m.)	F. (7).
Rotterdam–Croydon ...	16	38	14	14	16	2 38	Fokker H-NABN (2h. 20m.)	F. (8).
Manchester–Croydon–Amsterdam	14¶	72	—	4	14	5 19	—	D.H. 34 (4).
Amsterdam–Croydon–Manchester	18**	54	13	14	16	5 42	—	D.H. 34 (4).
Total for three weeks	234	907	107	142	217			

THE ROYAL AIR FORCE

London Gazette, March 30, 1923

General Duties Branch

The follg. are granted short service commns. as Flying Offrs. for seven years on active service list, with effect from, and with seny. of March 15 :—J. N. D. Anderson (Lieut., R.F.A., retd.), F. W. Barkley (Lieut., I.A., retd.), Lieut. I. E. Brodie (Lieut., R.N., retd.), L.H. Brooke (Lieut., I.A., retd.), J. J. C. Cocks (Lieut., R.A.R.O.Welch R.), H. C. Davies (Lieut., R.A.R.O., A. and S. Highlanders), U. C. de Burgh (Lieut., R.N., retd.), H. G. Kirkman (Capt., I.A., retd.), O. C. Noel (Lieut., I.A., retd.), A. R. Prendergast (Lieut., R.N., retd.), A. F. McC. Riggs, M.C. (Lt., R.A.R.O., K.O.Y.L.I.), V. J. Somerset-Thomas (Lieut., R.N., retd.), G. H. Stainforth (Lieut., R.A.R.O., The Buffs), R. Stiven (Capt., I.A., retd.), J. B. R. Windham (Capt., I.A., retd.).

The follg. are granted short service commns. as Pilot Offrs. on probation, with effect from, and with seny. of, March 15 :—R. E. Bath, W. D. Baxter, D. S. Brookes, J. Buckley, T. W. G. Cattell, R. A. A. Cole, C. J. A. Delany, J. E. Doran-Webb, H. V. Kerckhove, M.C., J. A. Ryper, J. E. Tomes, J. K. Trimmer, A. G. S. Tuke, E. G. Whinney, B. L. Young, S. A. Young.

Chaplains' Branch

The Rev. J. T. S. Law, M.A., relinquishes his short service commn. on ceasing to be employed, and is appt. an Hon. Chaplain to R.A.F. ; April 1.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Air Commodore : T. I. Webb-Bowen, C.B., C.M.G., to No. 3 Group Headquarters, Spittlegate, to command. 16.4.23.

Wing Commanders : A. S. Barratt, C.M.G., M.C., to No. 3 Group Headquarters, Spittlegate, for Air Staff duties. 6.4.23. G. P. Grenfell, D.S.O., to No. 7 Group Headquarters, Andover, for Technical Staff duties. 9.4.23.

Squadron-Leader : P. C. Sherren, M.C., to Armanent and Gunnery School, Eastchurch, for course of instruction. 4.4.23.

Flight-Lieutenants : J. R. Howett, to No. 12 Squadron, Northolt. 4.4.23. H. W. G. Jones, M.C., to No. 41 Squadron, Northolt, instead of to Cranwell, as previously notified. 4.4.23. J. A. Glen, D.S.C., and M. H. Butler, D.F.C., to No. 3 Group Headquarters, Spittlegate. 4.4.23. H. E. Walker, M.C., D.F.C., to No. 32 Squadron, Kenley. 4.4.23. W. A. C. Morgan, M.C., to No. 1 Flying Training School, Netheravon. 9.4.23. R. Whitaker, M.B.E., to No. 1 Stores Depot, Kidbrooke. 9.4.23. G. H. Cooper, M.C., D.F.C., to No. 10 Group Headquarters, Lee-on-Solent. 9.4.23. E. Drudge, M.B.E., to No. 10 Group Headquarters, Lee-on-Solent. 9.4.23. H. H. James, to R.A.F. Depot, Uxbridge. 1.4.23.

Flying Officers: H. C. Pyper and W. V. Hyde, to No. 41 Squadron, Northolt. 4.4.23. F. F. Garraway and F. W. Brown, to No. 3 Group Headquarters, Spittlegate. 4.4.23. J. G. Argles, to Basrah Group Headquarters, Basrah. 4.1.23. G. G. Walker, M.C., to No. 2 Flying Training School, Duxford. 9.4.23. P. Murgatroyd, to School of Army Co-operation, Old Sarum. 9.4.23. H. Batlin, to No. 2 Flying Training School, Duxford. 4.4.23. G. E. F. Boyes, to No. 100 Squadron, Spittlegate. 3.4.23.

Stores Branch

Flight-Lieutenants : F. Petch, O.B.E., and C. M. Bevan, to No. 3 Group Headquarters, Spittlegate. 4.4.23. W. Sutherland, M.B.E., to No. 1 Stores Depot. 9.4.23.

Flying Officer : V. S. Holbrook, to No. 41 Squadron, Northolt. 4.4.23.

Medical Branch

Flight-Lieutenants : J. A. Musgrave, D.P.H., to R.A.F. Base, Gosport. 5.4.23. E. G. S. Hall, M.B., to No. 1 School of Technical Training (Boys), Halton. 4.4.23. O. Armer (Dental), to R.A.F. Base, Leuchars. 9.4.23.

General Duties Branch

Flight Lieut.—H. S. P. Walmsley, M.C., D.F.C., to Inland Area Aircraft Depot, Henlow. 13.4.23.

Flying Officers.—T. Humble to No. 12 Squadron, Northolt. 16.4.23. C. H. F. Nesbit to School of Army Co-operation, Old Sarum. 11.4.23. W. H. Jinman to Headquarters, Coastal Area. 16.4.23. A. Hesketh, D.F.C., to R.A.F. Base, Calshot. 11.4.23.

Stores and Accountants' Branch

Flying Officer.—B. E. Hume-Wright (Accountant) to No. 2 Flying Training School, Duxford. 16.4.23.

Medical Branch

Squadron Leaders (Medical).—J. H. Porter, M.C., M.B., to Basrah Combined Hospital, Iraq. 13.1.23.

Flight Lieuts. (Medical).—D. G. Boddie, M.B., and T. J. Thomas, M.B., to Basrah Combined Hospital, Iraq. 13.1.23. T. J. Thomas, M.B., to No. 84 Squadron, Iraq. 28.1.23. R. J. Aherne, M.C., to Station Commandant, Iraq. 31.1.23. R. G. J. McCullagh to Basrah Combined Hospital, Iraq. 16.1.23. J. Prendergast, M.B., B.A., to Basrah Combined Hospital. 19.2.23.

Flight Lieuts. (Dental).—D. H. Williamson to Baghdad Combined Hospital, Iraq. 13.1.23. H. J. Higgins to Basrah Combined Hospital, Iraq. 13.1.23.

Flying Officers (Medical).—E. D. Gray, M.B., M.A., to Basrah Combined Hospital, Iraq. 13.1.23. G. Kinneir to Basrah Combined Hospital, Iraq. 14.2.23.

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The Health of the Air Force

THE annual report on the health of the Royal Air Force for 1921 is to hand, and from the vast amount of information it contains we glean the following salient facts. The general health of the Force for the year 1921 showed a considerable improvement on the previous year. In the case of India, which is included in the report for the first time, the rate of sickness was higher than any other area. The death-rate shows an increase from 4·4 per 1,000 in 1920 to 4·7 in 1921. There were 114 cases of injury or death from flying accidents, as compared with 71 during 1920. Of these, 60 cases were fatal accidents, and included in this number are 24 arising out of the " R.38 " disaster. The following figures show the total amount of flying carried out at home and abroad during the year, together with the numbers of fatal accidents : Machine flights, 76,008 ; machine hours, 49,222 ; fatal accidents, 22 ; machine flights per fatal accident, 3,455 ; machine hours flown per fatal accident, 2,238.

Important data is given in this report on sandfly fever, which has given much trouble in the Eastern areas, and other diseases, together with the various treatments employed to combat these. Some interesting facts are also given in reference to the Central Medical Board, including a statistical analysis of the physique of the officers of the R.A.F. in 1921, with special reference to the officer who is " fit for flying duties." A further important item dealt with consists of the question of glare and its effects on the eyes of pilots, especially in relation to their landing capacity. Ordinary tinted glasses were found to be useless in preventing glare, but good results have been obtained with special Crookes' glass, U.B.U.D. types. Copies of the report may be obtained from H.M Stationery Office, Kingsway, W.C. 2, price 5*s*.

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Personals.

Married

JOHN GWYNNE HOWELL, M.C. (late Major, R.A.F.), only son of Mr. and Mrs. Howell, Manorbier, Pembrokeshire, and grandson of the late Lieut.-Col. Howell, of Penrheol, Carmarthenshire, was married on April 7, at St. John's Church, Blackheath, to JESSIE ELIZABETH, daughter of the late DEPUTY INSPECTOR-GENERAL THEODORE J. PRESTON, R.N., and of Mrs. Preston, 108A, Shooter's Hill Road, Blackheath.

Major W. J. TEMPEST, D.S.O., was married on April 5, at All Saints' Church, Ennismore Gardens, London, to Miss ETHEL FERNANDES. It will be remembered that Major Tempest brought down a Zeppelin near Potter's Bar during the War.

Squadron Leader FREDERICK W. STENT, M.C., R.A.F., of Cairo, Egypt, was married in London, on February 14, to GLADYS E. COX, of 15, New Cavendish Street, London, W. 1.

To be Married

The marriage arranged between Flying Officer ULRIC C. DE BURGH, R.A.F., Lieut. R.N. (retired), and KATHLEEN, daughter of Mr. and Mrs. GEORGE USHER, 16, Grosvenor Crescent, Edinburgh, will take place at St. John's Church, Edinburgh, at half-past two o'clock on the 30th instant.

An engagement is announced between GEOFFREY DORMAN, only son of the late Charles Herbert Dorman and Mrs. Dorman, of " Hillsboro'," Sydenham, London, and MURIEL STEPHENSON, younger daughter of E. M. and Mrs. Stephenson, of 49, Crystal Palace Park Road, Sydenham, London.

A marriage will shortly take place between JOHN COTESWORTH SLESSOR, Flight-Lieut. R.A.F., eldest son of Maj. Arthur Slessor, late the Sherwood Foresters, and Mrs. Slessor, of Newland House, Eynsham, and HERMIONE GRACE, widow of Lieut.-Col. HERBERT CARTER, M.C., K.O.Y.L.I., and elder daughter of Mr. and Mrs. Gerald Guinness, of Dorton House, Buckinghamshire.

FLIGHT

POWER PLANTS FOR MODEL AEROPLANES

By A. F. HOULBERG

In dealing with so vast a subject as "Power Plants for Model Aeroplanes," it is not possible to go into the question of detail design, and it is proposed, therefore, to deal only with the basic principles governing the efficient design of the various types, which may be grouped under five headings as follows:—(1) Rubber motors; (2) C.O.2 motors; (3) compressed air motors; (4) steam motors; (5) petrol motors.

Rubber Motors

This type is undoubtedly the most popular for the reasons that it is light, cheap, easily repaired, easily adjusted for different power outputs, and reliable. Its main drawback is its great length, which tends to produce models which are disproportionate and difficult of direct comparison, or adaptation to full-size practice.

The amount of energy which can be stored in rubber varies enormously. It is dependent upon the quality and age of the rubber, and upon the nature of the lubricant used. Thus it is found that when first quality rubber is used dry it is only possible to store approximately 1,800 ft. lbs. of energy per pound of rubber, and that when it is efficiently lubricated as much as 4,300 ft. lbs. per lb. can be stored, or 2·4 times as much, quite an appreciable difference. From this it will clearly be seen that the question of efficient lubrication is an important one, and that care must be taken in its selection, particularly when we remember that rubber is very prone to deterioration on contact with certain liquids.

The ideal lubricant is the one which gives the maximum number of turns; has the least injurious effect; evaporates the least; and it usually takes the form of a solution of a good quality soap in water, to which is added a small quantity of pure glycerine, to reduce evaporation and act as a preservative.

It is necessary to know the maximum number of turns which can be given to any rubber motor, and I give for the first time the following empirical formula, which I have used with success:—

$R = \frac{K L}{\sqrt{W}}$ where R = number of turns. K = constant varying from 14·5 to 18 with the lubricant and rubber. L = length of motor. W = weight of motor.

It will be noticed that the constant K varies considerably, and I can only advise anybody wishing to use this formula to find their own constant for their own particular brand of rubber and lubricant. This is easily done, by checking the length, weight and maximum turns of the motor on their existing machine, and substituting them in the re-written formula—

$$K = \frac{R\sqrt{W}}{L}.$$

I should like to impress on model makers the importance of not referring to their power plant in terms of strands, but to deal only with the weight of the rubber.

It is of no use whatever noting that on your first outing with a model it flies well with, say, ten strands of rubber, because when you break that rubber and replace it with ten strands from another supply, you will probably find that your model will not fly so well. The reason for this is a slight variation in either the width or thickness of the fresh supply.

The number of turns and the torque vary with the *weight* of the rubber; therefore if you always deal with the rubber by *weight*, you will always know what results you will obtain. The question of motors of equal weight is also of great importance when two propellers are used, or on geared motors.

The greater use of fuselage models has brought the geared motor into considerable prominence, for the reason that a greater number of turns can be obtained for a given length of motor, and warping of the fuselage is minimised. In the case of a machine having an even number of geared motors, the torque of each motor being in the opposite direction to that of its neighbour, it follows that all the torque strains on the fuselage cancel out, but with an odd number of geared motors there will be one more gear revolving in one direction than in the other, and the fuselage will be subjected to the torsion due to this odd gear.

Most model aeroplane makers pay insufficient attention to the *mounting* of their gears, with the result that the drop in efficiency of the gearing more than counterbalances the advantages gained.

Great care should be taken to mount the gears the correct distance apart, on spindles supported on both sides of the gears, which are of sufficient stoutness not to whip, and a good fit in their bearings.

Good gears can have as high a transmission efficiency as 95 per cent., but this figure is seldom obtained, and may be as low as 60 per cent. on badly made and fitted gears. Gears mounted the correct distance apart should have at least two teeth in engagement at any time, whilst it will be found that only one tooth will engage at a time if the gears are mounted too far apart. This will double the load on each tooth, and quickly cause the breakdown of the gear.

Avoid the use of gears of small diameter, and those with small teeth.

We will now compare the results obtained from the two types of rubber motor.

Taking a plain rubber motor, 36 ins. long, weighing 2 ozs., we find that it is possible to obtain

$$\frac{18 \times 36}{\sqrt{2}} = 458 \text{ turns.}$$

By using two gears and the same length and quantity of rubber, we obtain

$$\frac{18 \times 36}{\sqrt{1}} = 648 \text{ turns.}$$

But if the efficiency of the gearing is 80 per cent., in order to obtain the same torque we must use $1\frac{1}{4}$ ozs. of rubber per gear. This brings the number of turns down to

$$\frac{18 \times 36}{\sqrt{1\frac{1}{4}}} = 636 \text{ turns,}$$

or an increase of approximately 40 per cent. over the plain motor. The resulting motor is, however, considerably heavier than the plain motor, and it is therefore necessary to compare motors of equal weights to obtain a true comparison.

Assuming the gears and their mounting to weight $\frac{1}{4}$ oz., this leaves us with $1\frac{3}{4}$ ozs. of rubber, or $\frac{7}{8}$ oz. per gear. The new length will be $\frac{36 \times \frac{7}{8}}{1\frac{1}{4}} = 25{\cdot}2$ ins. This gives us $\frac{18 \times 25{\cdot}2}{\sqrt{\frac{7}{8}}} = 489$ turns, which is only an increase of 6·76 per cent. From this it is clear that geared motors have very little advantage over plain motors where the number of turns for a given weight is concerned; the only points on which they score are shorter length and reduced torsional stress on the motor rod or fuselage.

Before leaving rubber motors it would be interesting to compare them with steel-spring motors. As previously mentioned, 4,300 ft. lbs. of energy per pound can be stored in rubber. The corresponding figure for steel, working under the very best conditions, is only 350 ft. lbs. per lb., which accounts for the lack of popularity of steel springs for model aeroplane work.

C.O.2 Motors

C.O.2 liquefies at a pressure of from 35 to 37 atmospheres, or at atmospheric pressure at a temperature of = 78° C.

It is usually stored in small steel cylinders, having a regulating valve terminating in a screwed nipple for connecting to the power plant. These containers must have a fairly high factor of safety to prevent the possibility of a burst, and are in consequence rather heavy.

When C.O.2, or any other gas for that matter, is released under such high pressure from a small nozzle, such as the inlet pipe of a model aeroplane engine, there is a rapid drop in temperature, with the result that the C.O.2 freezes and forms carbonic acid snow. C.O.2 snow does not evaporate very quickly, with the result that the inlet pipe to the engine gets rapidly choked up, and the engine slows down. To overcome this it is necessary to apply heat to the gas as it emerges from the cylinder. This is usually accomplished by coiling the inlet pipe inside a cylinder filled with boiling water. Water has a specific heat value of 1, while the value for C.O.2 is ·2169, which means that 1 lb. of water in losing 1° of temperature can raise 4·61 lbs. of C.O.2 gas 1° further. As water weighs 62·34 lbs. per sq. ft. and C.O.2 only weighs ·1234 lb. per sq. ft., it follows that, comparing equal volumes of each substance, 1 cubic ft. of water would only lose 1° of temperature in raising $\frac{4{\cdot}61 \times 62{\cdot}34}{{\cdot}1234} = 2{,}333$ cubic ft. of C.O.2 1°, from which it will be seen that water is quite a suitable medium for the purpose. The requirements of the engine portion of the plant being identical with those for compressed air, it is unnecessary to deal with them here, as they will be dealt with fully in the next section.

(To be continued.)

The Institution of Aeronautical Engineers

TO-NIGHT (Thursday, the 12th inst.), at the Engineers' Club, Coventry Street, W., commencing at 6.30 p.m., Mr. F. T. Hill, A.F.R.Ae.S., Member, will read before the Institution a paper entitled "Some Controversial Points in Aircraft Detail Design." Mr. Hill's paper is awaited with great interest, and a large and representative attendance is expected. The paper will be followed by a discussion, and any who would like to do so are invited to attend and to join in the discussion. Tickets are not required.

Students' Section, Royal Aeronautical Society

THE Students' Section of the Royal Aeronautical Society is giving a Smoking Concert for members of all grades of the Society, and their friends, at the Engineers' Club on Friday, April 27, at 7 p.m. Tickets, price 1*s.* 6*d.* each, are obtainable from the Secretary of the Society at 7, Albermarle Street, W. 1.

Royal Air Force Reserve

THE Regulations for the Royal Air Force Reserve have just been issued by the Air Ministry. We gave a preliminary summary of these regulations in our issues for February 15 and March 29, but in the Air Publication No. 938 referred to above, and which may be obtained from the Air Ministry, Kingsway, W.C. 2, the regulations are set forth in greater detail, so we would refer our readers to same, as lack of space prevents our publishing these in full. We may repeat, however, that approximately 300 ex-Service pilots or qualified civil pilots (Classes A and A.A.) are required this year for the Reserve of Air Force officers, and also a small number of officers for technical duties (Classes B and B.B.). No applications are desired at present for the C and D Classes of the officers' section of the Reserve, nor for the men's section (Class E).

Vacancies in Royal Air Force Nursing Service

THE Air Ministry announces that a few temporary Staff Nurses are required for the Royal Air Force Nursing Service. Candidates must be between 25 and 40 years of age, and have had three years' training in a recognised training school. Preference will be given to those holding additional certificates. Candidates under 35 years at the time of appointment will be considered for transfer to the permanent staff when vacancies occur. Pay and allowances are the same as those paid to the permanent members of the Service. Candidates should apply in writing to the Matron-in-Chief, Royal Air Force Nursing Service, Air Ministry, Kingsway, London, W.C. 2, before April 20, stating age, certificates held and experience.

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COMPANY MATTERS

Rolls-Royce, Ltd.

AT the annual meeting of the shareholders of Rolls-Royce, Ltd., held at Derby on March 29 last, Lord Wargrave, in moving the adoption of the balance-sheet and report, stated that during the past year Rolls-Royce aero engines had added to their already long list of achievements, notably in the King's Cup Circuit of Britain Race, the winning De Havilland being fitted with a Rolls-Royce engine. The company's aero department was exceptionally equipped from the designing and manufacturing point of view, backed by the ability of Mr. Royce and his capable designing staff. Their work was so highly thought of by the Government that during the War a greater horse-power of Rolls-Royce aero engines was put into the air than any other make. Since then the company had secured the services of Mr. A. J. Rowledge, whose name was so intimately associated with the design of other well-known aero engines. Whether the company's magnificent organisation in this respect was to continue depended on the future policy of the Government as to the size and efficiency of the air fleet they might deem necessary for the protection of this country.

The directors were anxious and troubled because of a proposal which had been made, and which was being considered by the Government, that the various companies engaged in the running of air services should be combined in one large undertaking, which would be a monopoly subsidised by the Government. It was suggested that if this subsidised combination was brought into existence it would, as a matter of economy, order engines from only one engine maker and planes from only one plane maker. This monopoly would practically put out of business all the other engine makers and plane makers, and from a national point of view it was difficult to believe that such action could be other than disastrous in the event of war or rumours of wars, seeing that these various organisations would not be at the disposal of the Government for the immediate manufacture of aero engines and aircraft. On the other hand, as long as the Government and the air services were giving these various concerns a sufficient number of orders to keep them going even to a limited extent the designing staffs would be maintained, and the Empire would be kept abreast, if it did not forge ahead, of the other countries of the world in respect of aero design and manufacture. He was glad to note that the Air Minister was alive to the danger, for in the House of Lords last week he stated that "from the point of view of national security another important factor is the keeping alive and encouraging of the aircraft industry in this country, so that in the event of war an immediate expansion could be made in the number of machines required for military service."

* * * *

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* * * *

PUBLICATIONS RECEIVED

Gliding and Soaring Flight. By J. Bernard Weiss. London: Sampson Low, Marston and Co., Ltd. Price 5*s.* net.

Department of Overseas Trade. Report on the Economic and Financial Conditions in Bulgaria, January 31, 1923. By D. MacKillop. London: H.M. Stationery Office, Kingsway, W.C. Price 6*d.* net; by post, 7*d.*

Report on the Health of the Royal Air Force for the Year 1921. *Air Publication* 934. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 5*s.* net.

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AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor
The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

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Published April 12, 1923

30,031. VICKERS, LTD., O. H. D. VICKERS and M. K. INGOLDBY. Control of aircraft. (194,745.)
30,542. L. G. FRISE and BRISTOL AEROPLANE CO., LTD. Control-surfaces for aircraft, etc. (194,753.)
30,661. C. L. WILSON. Petrol, etc., tank. (194,755.)
34,225. W. J. MUTTON. Aeroplanes, etc. (194,802.)
34,277. F. L. M. BOOTHBY. Fuel tanks. (194,806.)

APPLIED FOR IN 1922

Published April 12, 1923

5,494. H. O. SHORT. Landing-gear. (194,913.)

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